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# ENFORCEMENT OR INCENTIVES? PROMOTING SAFETY BELT USE AMONG MILITARY PERSONNEL IN THE NETHERLANDS

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During a nationwide campaign to promote safety belt use among military personnel, a field study was conducted at 12 different military bases in the Netherlands. Amount of enforcement, type of publicity, and incentive strategies were varied among military bases. Observations of safety belt use among servicemen in their personal vehicles were conducted before the campaign, immediately following the campaign, and 3 months later. Safety belt use increased from 65% during baseline to 73% directly after the campaign and to 76% 3 months later. An overall 28.6% increase in safety belt use (from 63% to 81%) was observed at seven bases, whereas no changes were found at five bases (68% on all occasions). To a large degree the effects were due to a 37.7% increase among young drivers. These results confirmed that enforcement, as well as incentives, can be effective in promoting safety belt use. However, treatment effects were not systematic, thereby complicating the interpretation of the results. Implications of these varied outcomes are discussed.

DESCRIPTORS: traffic safety, behavior modification, safety belts, incentives, police enforcement

Although most drivers recognize that vehicle safety belts are effective in reducing or preventing driver injuries, many do not use safety belts. In the Netherlands, a safety belt mandate was enacted in 1975; national belt use rates increased from 20% in 1974 to 50% in 1975 and to 70% in 1988 (Varkevisser & Arnoldus, 1989). However, young male drivers use their safety belts less often than other groups. Thus, legislation alone is not sufficient to achieve universal use of vehicle safety belts. Young male drivers are also frequently involved in accidents; thus, safety belt use is especially critical for this group (Van Kampen, 1988). Therefore, a nationwide campaign was designed to promote safety belt use among military personnel, a population made up primarily of young males.

Previous studies have demonstrated that campaigns consisting of a combination of enforcement and publicity can increase safety belt use rates substantially (e.g., Jonah & Grant, 1985; Williams, Lund, Preusser, & Blomberg, 1987; Williams, Wells, & Lund, 1987). Gundy (1988) and Grant (1989) each found that, after 2 years, belt use rates remained higher than the original baseline levels.

Incentive programs have been successful in increasing safety belt use (e.g., Cope, Smith, & Grossnickle, 1986; Elman & Killebrew, 1978; Geller, 1988; Geller, Kalsher, Rudd, & Lehman, 1989; Geller, Rudd, Kalsher, Streff, & Lehman, 1987). These studies varied the type and frequency of rewards for belt use, and all increased safety belt use significantly. However, these findings must be tempered by the fact that all were carried out in the absence of a safety belt use mandate; therefore, baseline use rates in each of these programs were relatively low (10% to 20%). Unfortunately, use rates have typically decreased within a few weeks following withdrawal of the incentive programs. Cope et al. (1986) presented one of the few studies finding no decrease in postintervention use rates after 6 months.

Little is known about the relationship between enforcement levels and safety belt use. A direct comparison of the relative efficacy of enforcement and incentive programs has been carried out only once under conditions of mandatory requirement of safety belt use (Kalsher, Geller, Clarke, & Lehman, 1989). These researchers evaluated safety belt promotion campaigns on two U.S. naval bases. In their study, the enforcement ("disincentive") pro-

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Table 1

The experimental design. The rows represent the experimental conditions. The first column shows the activities during the first month of the campaign, the second shows the activities during the second month, the third shows the 12 different bases allocated to the conditions, the fourth shows the estimated size of the population at that site, and the fifth and sixth show the number of hours spent on surveillance by the military police and the number of registered fines, respectively.

| October 1988 | November 1988 | Base | *N* on base | Hours | Fines |
|---|---|---|---|---|---|
| No extra publicity | Minimal enforcement | (1) P/MI | 1,800 | 16 | 20 |
| Extra publicity | Minimal enforcement | (2) EP/MI | 2,200 | 26 | 4 |
| No extra publicity | Moderate enforcement | (3) P/MO | 1,500 | 72 | 5 |
| | | (4) P/MO | 850 | 32 | 15 |
| Extra publicity | Moderate enforcement | (5) EP/MO | 400 | —[a] | —[a] |
| | | (6) EP/MO | 1,400 | 32 | 2 |
| No extra publicity | Intensive enforcement | (7) P/IN | 3,500 | 60 | 100 |
| Extra publicity | Intensive enforcement | (8) EP/IN | 1,850 | 24 | 6 |
| Extra publicity | Group-dependent incentives | (9) EP/GR | 600 | — | — |
| Extra publicity | Group-dependent incentives | (10) EP/GR | 600 | — | — |
| Extra publicity | Individual incentives 1 prize/week | (11) EP/INC1 | 1,000 | — | — |
| Extra publicity | Individual incentives 4 prizes/week | (12) EP/INC4 | 800 | — | — |

[a] No data available.

gram led to greater overall increases in belt use than did the incentive program. Six months after the intervention programs were removed, belt use declined on both the "incentive" and the "disincentive" bases. The present study varied systematically, across military bases, the amount of enforcement, type of publicity, and type of incentive strategy.

## METHOD

### *Participants and Setting*

A total of 12 different Army, Navy, and Air Force bases located throughout the Netherlands participated. Base populations varied from approximately 400 to 3,500 (see Table 1). Participants included all personnel (drafted, enlisted, and civilian) who drove through the entrance/exit gates.

### *Procedure*

*Observation procedure.* Baseline belt use rates were observed June through September 1988; the next measurements took place at the beginning of December 1988, directly after the campaign ended; follow-up observations occurred in February 1989.

Observation methods included both unobtrusive observations and obtrusive observations. During unobtrusive observations, a trained observer stood next to the gate and recorded the shoulder[1] belt use of all passing drivers at a distance of approximately 1 m. During this condition, shoulder belt use or nonuse could be determined in at least 99.5% of all observations. This method, however, did not allow for a distinction between different age groups, types of personnel, or base assignments. Therefore, obtrusive observations were conducted in which military police stopped vehicles before they entered the gates during morning arrivals and after they exited the gates during afternoon departures. Trained observers asked each driver about his base assignment, age, and whether he was drafted, enlisted, or a civilian. At the same time, the observer scored whether the driver was using a shoulder belt. Shoul-

[1] Since June 1, 1975, all passenger cars in the Netherlands (but not, e.g., delivery vans) are equipped with seat belts (lap or shoulder) in front seats; in practice, virtually all passenger cars have shoulder belts. Vehicles without a shoulder belt for the driver were not included in the observations.

der belt use could be determined for at least 99.9% of these observations.

Observations took place on weekdays, between 6:30 and 8:30 a.m. for entering vehicles and between 3:00 and 5:00 p.m. for departing vehicles. For all experimental phases, unobtrusive observations occurred unannounced on a randomly selected weekday, and obtrusive observations took place on two randomly chosen weekdays.

*General procedures.* The campaign, which began in October 1988, was conducted over a period of 2 months. The first month was used to announce the campaign. For those bases assigned to incentive treatments, special brochures were disseminated that outlined the intervention condition. Personnel at those bases assigned to enforcement treatments received brochures containing information about penalties for not buckling up. Other publicity materials included stickers, playing cards, and posters with the special campaign logo printed on them. In addition, local newspapers, military newspapers, and radio stations provided some media coverage about the campaign.

Extra publicity was used on some bases. For instance, a movie entitled *An American* was made that portrayed the importance of the safety belt embedded in a thriller-like plot about a boy and his "old American dream car." Special 30-s video spots on safety belt use, featuring young males in the leading roles, were developed and shown to the personnel. Also presented were demonstrations with a crash simulator, in which volunteers experienced actual *g* forces of low-speed crashes, and talks by traffic safety experts.

The fine for not using a safety belt when riding in the front seat of a vehicle while at these bases varied from a warning to a fine of Dfl. 35 (about $17) to Dfl. 65 (about $30). During the second month of the campaign, drivers and their front-seat passengers at their respective bases were punished (i.e., either warned or fined) or rewarded, dependent upon intervention type. The military police departments involved were requested to report the number of hours they spent on surveillance and how many fines they recorded during the enforcement campaign.

*Experimental Conditions*

Three levels of enforcement were implemented: (a) minimal (4 hr of surveillance), (b) moderate (16 hr), and (c) intensive (32 hr) during the last 4 weeks of the campaign. Level of enforcement was factorially combined with type of publicity, resulting in six experimental conditions distributed over eight military bases.

Four additional bases served as experimental groups to investigate effects of incentive programs. On these four incentive bases, no enforcement was implemented. Two bases had a contest or group-dependent incentive during the campaign; Dfl. 5,000 (about $2,500) in cash would be won by the whole group of personnel at the base showing the highest belt use rate at the end of the campaign. The prize was to be spent on a party or other activity, in such a way that all personnel could benefit from the prize. On two other bases, an individual incentive program was implemented during the second month of the campaign, whereby lottery tickets were distributed to drivers and front-seat passengers who were observed using their safety belts. Incentive rates were varied as follows: on one base one prize was drawn every week, whereas on the other base four prizes were drawn every week. Prizes included money coupons, photocameras, portable cassette tape players, and compact disc players (see Table 1 for an overview of the experimental design).

## RESULTS

A total of 21,671 obtrusive observations were taken, of which 10,888 occurred during baseline, 5,642 immediately following the campaign, and 5,141 during follow-up observations. A total of 17,072 unobtrusive observations were made, of which 7,486 occurred during baseline, 3,495 immediately following the campaign, and 2,922 during follow-up.

Figure 1 depicts the percentages of drivers using a shoulder belt during each condition. In most, but not all, cases, the obtrusive observations differed significantly from the unobtrusive observations. Overall mean safety belt use was 71.9% during

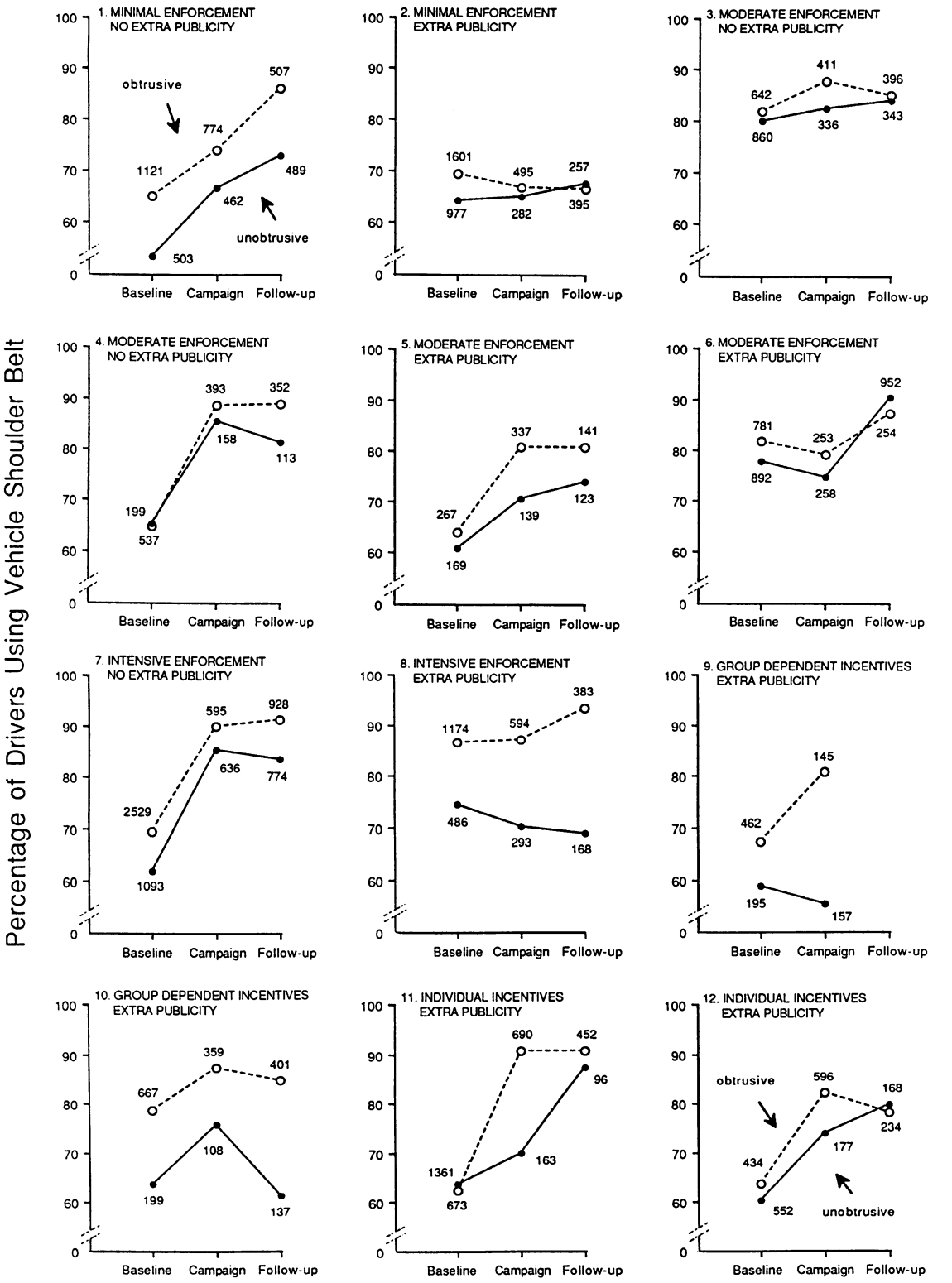


Figure 1. Percentages of drivers using a safety belt for each condition and experimental phase. Open circles connected by dotted lines represent results of obtrusive observations; solid points represent results of unobtrusive observations. The numbers associated with each data point indicate the number of observations.

baseline obtrusive observations, 83.1% directly following the campaign, and 86.2% during follow-up. Overall mean belt use during unobtrusive observations was 65.4% during baseline, 72.9% directly following the campaign, and 76.1% during follow-up.

*Log-Linear Analyses*

A log-linear analysis (using the CATMOD-procedure provided by SAS Institute, 1985) was conducted on data collected unobtrusively with belt use as the dependent variable and both base (1 through 12) and experimental phase (1 through 3) as independent variables. This analysis revealed significant main effects for both base, $\chi^2(11) = 215.9$, $p < .001$, and experimental phase, $\chi^2(2) = 55.0$, $p < .001$. The interaction between base and experimental phase was also significant, $\chi^2(21) = 156.9$, $p < .001$. At seven bases, observed belt use increased during the period of study (Bases 1, 4, 5, 6, 7, 11, and 12 in Figure 1), and at five bases no increase was found (Bases 2, 3, 8, 9, and 10 in Figure 1). These results reflect no systematic variation with treatment condition, thereby complicating an interpretation of the results.

When the experimental conditions were divided into two groups (enforcement vs. incentive programs) a log-linear analysis revealed significant main effects of program type, $\chi^2(1) = 25.4$, $p < .001$, and experimental phase, $\chi^2(2) = 88.8$, $p < .001$, but no significant interaction between program type and experimental phase, $\chi^2(2) = 1.1$, $p > .50$. This suggests that both enforcement and incentive programs had the same overall effect. Enforcement and incentive programs showed mean increases from 67% and 62% during baseline to 75% and 69% directly after the campaign, and to 78% and 76% during follow-up, respectively.

When the bases were divided into two groups, those with extra publicity (EP) and those without extra publicity (P) during the campaign, a main effect of amount of publicity, $\chi^2(1) = 12.7$, $p < .001$, was found, as well as a significant interaction between amount of publicity and experimental phase, $\chi^2(2) = 83.5$, $p < .001$. Interventions of P and EP, respectively, showed observed safety belt use rates of 65% and 69% during baseline, of 80% and 70% directly after the campaign, and of 80% and 75% during follow-up, respectively. Thus, an unexpected inverse relationship between type of publicity and increase in belt use was observed.

*Age and Personnel Groups*

To investigate the effects of age and personnel group, additional log-linear analyses were performed on the data obtained with the obtrusive observations. A significant main effect of age was obtained, $\chi^2(1) = 177.9$, $p < .001$, as well as an interaction between age and experimental phase, $\chi^2(2) = 29.1$, $p < .001$. Also, a main effect of personnel group was found, $\chi^2(1) = 168.1$, $p < .001$, but the interaction between personnel group and experimental phase was not significant, $\chi^2(2) = 3.2$, $p > .05$. Figure 2 illustrates these results. Because the second-order interaction between base, age, and personnel group was not significant, $\chi^2(11) = 16.0$, $p > .10$, the observations were averaged over all 12 sites. Observed values for civilian personnel were left out of these comparisons because of the very small sample size for this group.

Figure 2 shows that drafted personnel younger than 25 years old had an average safety belt use of 58% during baseline, increasing to 77% directly after the campaign and to 83% during follow-up. Enlisted personnel younger than 25 had an observed belt use of 68% during baseline, 85% directly after the campaign, and 87% during follow-up. Drafted personnel 25 years old or older had an observed belt use of 80% during baseline, 79% directly after the campaign, and 82% during follow-up. Enlisted personnel of this age group showed 84% of belt use during baseline, 89% directly after the campaign, and 90% during follow-up. Thus, the observed increases in belt use throughout the entire period of study were almost entirely due to a belt use increase of 37.7% above baseline by drivers under 25 years of age (from 61% to 84%). Drivers 25 years or older showed an increase of only 6.0%. It should be noted, however, that their baseline level was much higher (an increase from 84% to 89%).

Log-linear analyses revealed no main effect of

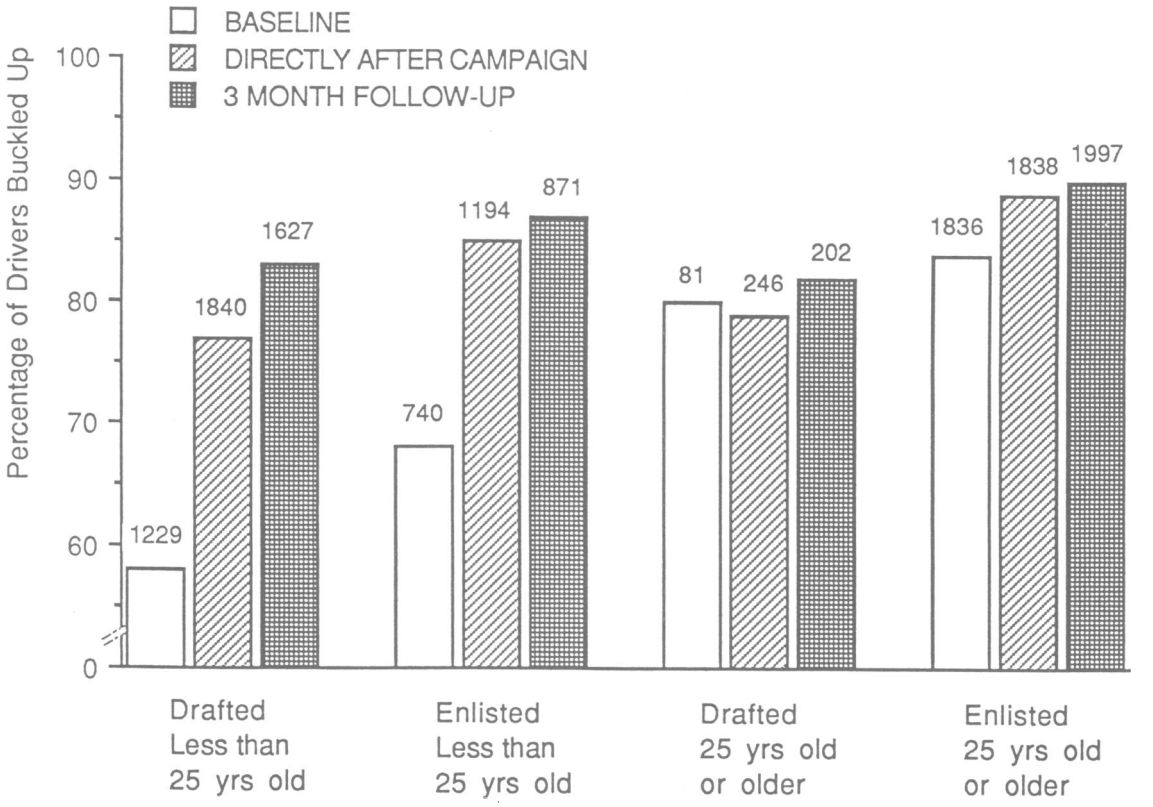


Figure 2. Observed safety belt use for drivers 18 to 24 years old compared to those 25 years old or older, for drafted and enlisted personnel. The number associated with each bar indicates the number of observations.

observation day, $\chi^2(1) = 3.48$, $p > .05$; entering versus departing traffic, $\chi^2(1) = 0.22$, $p > .50$; and no interaction between these variables, $\chi^2(1) = 0.02$, $p > .50$.

### *Actual Police Effort*

A post hoc analysis of actual military police effort found that it varied from base to base, ranging from 16 to 72 hr of surveillance and from 4 to 100 fines registered (see Table 1). Treatment allocations were not reflected in actual reported hours nor number of fines. However, the number of fines per hour variable had a correlation of 0.80 (Pearson $r$, $p < .05$) with observed increases in belt use.

## DISCUSSION

The effects found were almost entirely attributable to a dramatic belt use increase of 37.7% for young drivers between 18 and 25 years old. Because the campaign was aimed at this group of drivers in particular, this result fulfilled an important campaign objective. Drivers 25 years old and older showed only a 6.0% increase over baseline, but because their baseline level was already above the 70% mean belt use in the Netherlands, this was not really surprising.

Quite unexpectedly, different baseline belt use rates for drafted personnel and enlisted personnel were found (especially for drivers under 25 years old). Previous research has found safety belt promotion campaigns to have differential effects on blue-collar versus white-collar personnel (Geller & Bigelow, 1984); our findings may reflect similar population differences.

No systematic effects of enforcement level (as originally anticipated) upon belt use were found. It is difficult to understand why the same amount of enforcement led to an enormous increase in safety belt use on one base but had no effect at another.

However, the actual effort of the police (in terms of number of fines per hour) was related to these differences: The more police effort, the higher the observed increase in belt use. This suggests that enforcement indeed enhances safety belt uses substantially, *if* the enforcement is actually carried out. It is realized that a linear regression model based on only seven observations (because of missing values for one base; see Table 1) is hardly convincing. In addition, "number of fines per hour" might not be the most suitable measure of police effort. However, no other information relevant to amount of enforcement was available.

The awareness of the campaign was rather disappointing. No effect of extra publicity on observed belt use was found when publicity (P) and extra publicity (EP) treatments were compared. Counter to expectations, the P condition showed greater impact than the EP condition. Results from a written survey (Hagenzieker, 1990) revealed that only 40% of the respondents reported to have noticed an increase in publicity during the campaign. The results from the questionnaire also showed that respondents from the EP treatment conditions did not report to have noticed the publicity more often than respondents from the other conditions. In addition, the military police who distributed the publicity materials reported an insufficient supply of handouts. Therefore, it can tentatively be concluded that extra publicity might have been effective if the personnel had in fact been exposed to the extra materials.

An important finding of the present study was that incentive programs are capable of enhancing safety belt use beyond high initial baseline belt use rates. This holds especially for the individual incentive programs (INC1 and INC4), which showed medium-term increases. Because the differences in effects between the two conditions (one prize per week vs. four prizes per week) were rather small and not statistically significant, it cannot be determined which strategy is more effective. The results of the group-dependent incentive (GR) program showed at best only a short-term effect. Because a whole group won the prize, including the nonusers of safety belts, this condition might also be considered a noncontingent reward program; noncontingent rewards are known to have less impact than contingent rewards, such as those applied in the individual incentive treatments (e.g., Geller, Paterson, & Talbott, 1982). Therefore, in accordance with previous findings, this contingent versus noncontingent distinction may explain the differences found for the individual versus group incentive treatments.

On average (i.e., across all conditions) safety belt use had not decreased 3 months after withdrawal. In contrast, on most bases it had actually increased even further compared to observations directly after the campaign. These results were counter to expectations. An optimistic interpretation of the results obtained would be that the campaign was successful in establishing long-term maintenance of the target behavior. A more realistic interpretation is that the police, stimulated by the campaign, continued or even increased enforcement efforts after the formal end of the campaign.

In a recent study, Kalsher et al. (1989) investigated the relative impact of incentive and enforcement (disincentive) programs on two U.S. naval bases. Their study is comparable to the present one in many respects. Kalsher et al. found that, at one navy base, the use of safety belts increased by 10 percentage points during a 4-week incentive program which was similar to the results of the individual incentive programs we employed; at another naval base a 24 percentage point increase was observed during the 3-week enforcement phase. These investigators attributed the greater impact of the disincentive program almost entirely to a dramatic increase in belt use when vehicles entered the gates. (In the present study, no effect of entering versus departing traffic on observed belt use was found.) With regard to departing vehicles and follow-up, the impact of the two intervention approaches (i.e., incentives vs. disincentives) was equivalent in the Kalsher et al. study. As in the previous study, in the present study the average impact of enforcement and incentive interventions was the same, and was also about the same size as reported by Kalsher et al. We found a medium-term increase of 11 percentage points on the en-

forcement treatment bases and an increase of 14 percentage points on the incentive treatment bases. Moreover, the baseline levels were comparable (i.e., about 60% buckled up in both studies).

Finally, a number of weaknesses in the present study should be mentioned. First, the study lacked a nonintervention control group. Unfortunately, when conducting field studies it is often not possible to include a control group. The field study involving the experimental treatments could take place only when implemented in an already organized nationwide campaign at all military bases in the Netherlands during the same period, or not at all. The lack of control groups complicated the interpretation of the results, because only comparisons of effects relative to each other could be established.

Second, the target behavior of all experimental groups should ideally be comparable before the interventions. However, because safety belt use was never studied previously in a military setting in the Netherlands, no matching on the basis of baseline belt use was possible.

A third complicating factor was that the two observation methods yielded different results. In general, belt use was higher during the obtrusive than during the unobtrusive observations. The presence of military police during the obtrusive observations may have prompted (or activated) general "careful" behavior by drivers, including the use of a safety belt.

## REFERENCES


Cope, J. G., Smith, G. A., & Grossnickle, W. F. (1986). The effect of variable-rate cash incentives on safety belt use. *Journal of Safety Research,* **17,** 95–99.

Elman, D., & Killebrew, T. J. (1978). Incentives and seat belts: Changing a resistant behavior through extrinsic motivation. *Journal of Applied Social Psychology,* **8,** 72–83.

Geller, E. S. (1988). A behavioral science approach to transportation safety. *Bulletin of the New York Academy of Medicine,* **64,** 632–661.

Geller, E. S., & Bigelow, B. E. (1984). Development of corporate incentive programs for motivating safety belt use. *Traffic Safety Evaluation Research Review,* **3,** 21–38.

Geller, E. S., Kalsher, M. J., Rudd, J. R., & Lehman, G. R. (1989). Promoting safety belt use on a university campus: An integration of commitment and incentive strategies. *Journal of Applied Social Psychology,* **19,** 3–19.

Geller, E. S., Paterson, L., & Talbott, E. (1982). A behavioral analysis of incentive prompts for motivating seat belt use. *Journal of Applied Behavior Analysis,* **15,** 403–415.

Geller, E. S., Rudd, J. R., Kalsher, M. J., Streff, F. M., & Lehman, G. R. (1987). Employer-based programs to motivate safety belt use: A review of short-term and long-term effects. *Journal of Safety Research,* **18,** 1–17.

Grant, B. A. (1989). *Differential response of vehicle occupants to seat belt enforcement programs.* Paper presented at the International Symposium on Driving Behaviour in a Social Context (under the patronage of EC/ECMT/WHO and organized by PRI), May 16–18, 1989. Paris.

Gundy, C. M. (1988). The effectiveness of a combination of police enforcement and public information for improving seat-belt use. In J. A. Rothengatter & R. A. de Bruin (Eds.), *Road user behavior: Theory and research* (pp. 595–600). Assen/Maastricht: Van Gorcum.

Hagenzieker, M. P. (1990). *Evaluation of a seat belt promotion campaign among military personnel.* Leidschendam, the Netherlands: SWOV Institute for Road Safety Research, Report R-90-14. [in Dutch]

Jonah, B. A., & Grant, B. A. (1985). Long-term effectiveness of selective traffic enforcement programs for increasing seat belt use. *Journal of Applied Psychology,* **70,** 257–263.

Kalsher, M. J., Geller, E. S., Clarke, S. W., & Lehman, G. R. (1989). Safety belt promotion on a naval base: A comparison of incentives vs. disincentives. *Journal of Safety Research,* **20,** 103–113.

SAS Institute. (1985). *SAS user's guide: Statistics, version 5 edition.* Cary, NC: SAS Institute Inc.

Van Kampen, L. T. B. (1988). *Traffic 'unsafety' of young and unexperienced drivers.* Leidschendam, the Netherlands: SWOV Institute for Road Safety Research, Report R-88-45. [in Dutch]

Varkevisser, G. A., & Arnoldus, J. G. (1989). *Presence and usage of seat belts in 1988.* Leidschendam, the Netherlands: SWOV Institute for Road Safety Research, Report R-89-11. [in Dutch]

Williams, A. F., Lund, A. K., Preusser, D. F., & Blomberg, R. D. (1987). Results of a seat belt use law enforcement and publicity campaign in Elmira, New York. *Accident Analysis & Prevention,* **19,** 243–249.

Williams, A. F., Wells, J. K., & Lund, A. K. (1987). Shoulder belt use in four states with belt use laws. *Accident Analysis & Prevention,* **19,** 251–260.


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